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ABSTRACT

Described is a learning session on water conservation intended for citizen advisory groups interested in water quality planning. Topics addressed in this instructor's manual include water conservation needs, benefits, programs, technology, and problems. These materials are components of the Working for Clean Water Project. (Author/WB)

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Working for Clean Water

An Information Program for Advisory Committees

Water Conservation and Reuse

Instructor Guide

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION

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TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

Water Conservation and Reuse

Water conservation will play an ever-increasing role in balancing our water resource needs. Water use and wastewater production are interrelated; so, conservation or water has a two-fold impact. Upon completion of this presentation the participant should be able to:

- recognize situations that warrant water conservation
- recognize the benefits that might accrue from water conservation
- define the role of public attitudes and pricing in water conservation
- describe devices used in residential and commercial water conservation
- discuss the potential for water reuse
- recognize potential problem areas when implementing a water conservation program
- plan an implementation scheme for a water conservation program.

Required Materials

☐ 16 mm film, "The Alternative is Conservation"

☐ 16 mm movie projector and screen

☐ Flip charts and easel and/or set of transparencies and overhead projector for guided discussion

☐ Copy of handbook, "Water Conservation and Reuse," for each participant

☐ Copy of "Household Water Usage Inventory" for each participant. (A copy can be found in the Appendix.)

Important Notes

1. Before this presentation the instructor should select at least one case study from those included in the handbook and incorporate it into the guided discussion. Additional case studies may be developed by the instructor to address specific problems in a local or regional area.

2. Class discussion will have to be tightly controlled if the time schedule is to be followed. The case study comparison on pricing in item 6 of the guided discussion is optional; it may be included if time permits.

3. Brochures describing various new or retrofit water-saving devices, as well as pictures of installed devices, should be obtained to use as an informational resource for the advisory group.

4. The instructor may wish to have someone who is knowledgeable in the area of water pricing methods attend the presentation and help answer questions.

5. Copies of water-saving plumbing codes should be available as an informational resource for the advisory group.

Suggested Activities

Introductory Comments	5 minutes
Film Presentation	20 minutes
Guided Discussion	25-45 minutes
Question and Answer Session	10 minutes
TOTAL TIME	60-80 minutes

Introductory Comments (5 minutes)

1. Open the session with several eye-opening facts concerning water conservation to generate interest. Here are some suggestions:

- Wastewater is 99.9% pure water

- Americans use twice as much water in their households as Europeans do

- Each of us uses 50-70 gallons of water per day, only a couple of pints of which are actually consumed

- If just 35% of the residents of California put in toilet dams and 10% put in low-flow showerheads, the water saved would be enough for an additional four million people

- Water that is wasted is water unnecessarily polluted

- Water that is not used is water and wastewater that doesn't have to be treated.

2. Go over the key questions. Ask the participants if they have other questions they wish to add concerning water conservation and reuse.

List questions on chalkboard or flip chart.

Film Presentation (20 minutes)

1. Show the film "The Alternative is Conservation." This is an introductory film that is motivational in approach. It interviews people on the street, and people active in water conservation from across the United States. Detailed types of water conservation devices, approaches, or expected savings are not covered in the film.

Prior to showing the film ask the participants to look for key points made in this film:

- Reasons for conserving (drought, wastewater treatment problems, new supply postponement, dependence on remote sources)

- Public attitudes and knowledge (mostly favorable, little knowledge of where water goes after use)

- Ways to conserve (devices, landscaping changes, recycle)

- Impacts of conservation (sewage farm, onsite disposal, alleviate problems of supply).

Guided Discussion (25-45 minutes)

Note: Contents of all charts are in the Appendix.

1. What are the primary uses of water? Ask the participants to give examples of how water is used in their local area. Make a list of water uses and be sure to include examples in the following categories:

Chart 1 shows these four major uses of water.

Industrial
Commercial
Agricultural
Residential

Mention that the largest user varies from locality to locality. A study is necessary to determine the large users in the local area.

Discuss the nonconsumptive nature of water usage.

Case studies are provided in the handbook. Others can be found in the Selected Resources.

Select a case study to use as an example throughout this discussion. Begin by giving some background material on the community involved. Then note the primary uses of water in the study area and how they were determined.

2. Discuss residential water use in more detail. Point out that the case studies are primarily involved with sites where residential water use is a major portion of total use, but that other situations exist as well. For example, industry can be an enormous user of water.

Use chart 2.

Mention the difference in consumption rates between public and private systems.

Use chart 3.

Ask the participants if they know how much water they consume. Explain to them how to determine the usage for their household or community.

Chart 4 illustrates this point.

Mention that nearly 80 percent of the water used in an average household is for bathing and toilet use.

3. Discuss the reasons why a community may want to implement a water conservation program. Mention the reasons why the community in the case study wanted to save water. Be sure to include the following:

Water shortage
Wastewater treatment plant overload
Energy savings
Economic savings
Environmental pollution
Cost-effectiveness guidelines.

Use chart 5.

4. Discuss ways to implement a water conservation plan. Include the following:

Education
Public relations
Pricing strategies
Plumbing codes
Water-saving devices

Use chart 6.

Which of these ways were used in the case study? Why did the community choose this particular approach?

Discuss active versus passive considerations.

5. Discuss the advantages and disadvantages of various educational and public relations approaches.

6. Discuss the impact of pricing on water consumption. Begin by going over various pricing structures, such as:

Set price
Flat rate
Decreasing block rate
Increasing block rate

Chart 7 lists the four pricing structures. (Charts 8, 9, 10, and 11 are graphs illustrating these pricing approaches.)

If there is sufficient time, use the case studies on Dallas, Elmhurst, and Washington Suburban Sanitary Commission to compare different approaches to water conservation.

Ask the participants which rate their water supplier uses.

7. Discuss the common devices used for domestic water conservation. Mention any devices used in the case study.

Chart 13 shows water usage for various toilet systems.

Pictures and brochures of other water-saving devices should also be included.

Ask participants if they know which plumbing supply houses stock water-saving devices in their community.

Discuss the potential savings of energy and dollars that can be obtained from the use of these devices. Evaluate any measured or predicted savings discussed in the case study.

8. Review the use of plumbing codes. Were plumbing codes used in the case study? Mention that the present trend is towards 3.5 gallons per flush toilets and 3 gallon per minute showerheads.

Use chart 13 to illustrate possible ways to reuse water.

9. Evaluate the potential for water reuse. Ask the group to recall the reuse situation presented in the film.

In what ways can water be reused in the local area?

Question and Answer Session (10 minutes)

1. Use the key qeustions given in the handbook to promote discussion. Remember to relate the discussion to the local area.

A copy can be found in the Appendix

2. Give each participant a copy of the "Household Water Usage Inventory." Ask them to determine the following at home before the next meeting:

- their per capita household water usage
- their water bill structure
- local plumbing supply houses which have water-saving devices in stock.

You might also ask them to write a model water-saving plumbing code for their area.

Selected Resources

Agricultural Water Conservation Conference Proceedings. Sponsored jointly by the California Department of Water Resources and University of California Cooperative Extension Service, June 1976. 249 pp.

These proceedings result from a conference on agricultural water conservation in California; however, many of the conclusions are applicable nationwide. Both approaches and policy are discussed in these proceedings. It is available from the California Department of Water Resources, P. O. Box 388, Sacramento, CA 95802, attn: Dean Thompson.

Directory of Federal Programs Related to Water Conservation. Draft copy. Washington, DC: U.S. Environmental Protection Agency, Office of Water Programs Operations, November 1978. 72 pp.

This is a directory of federal programs by agency, including type of assistance, nature of program, water conservation provisions, eligibility, fiscal scope of program applicant eligibility, and informational contact. It is available from EPA, Facility Requirements Division (WH595), 401 M Street, S.W., Washington, DC 20460.

Hassenplug, J., and Eskind, N. "Water Conservation Methods - Practical and Legal Aspects." Paper presented at 1978 American Water Works Association Conference, Atlantic City, NJ: June 1978. 12 pp.

This paper presents the case history of the North Tahoe, CA water conservation program including the problem, the development of ordinances, the device distribution, and the public information programs. Preliminary results are also included. This paper is available as part of a two-volume set of the 1978 Annual Conference Proceedings, Catalog number 20142, for $20.00 from the American Water Works Association, 6666 W. Quincy Avenue, Denver, CO 80235.

McGhee, R., et al., eds. Readings in Water Conservation. Washington, DC: National Association of Counties Research, Inc., 1978. 332 pp.

This document represents an extensive collection and synthesis of recent publications in water conservation. Areas covered extensively are regulations, infiltration and inflow, devices, education, land use, planning, pricing policies, economics, and reuse. This collection is national in scope. Copies may be obtained from National Association of Counties Research, Inc., 1735 New York Avenue, NW, Washington, DC 20006.

Milne, M. Residential Water Conservation. California Water Resources Center Report No. 35. Davis, CA: University of California, 1976. 469 pp.

A comprehensive but non-technical report on residential water conservation covering factors influencing water use, devices, and applications. It also discusses costs of treatment of wastes and laws from California's viewpoint. It is available for $14.50 as order no. PB-253-253/9 from National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22161.

Myer, L. et al. "Two Cities Meet Conservation Challenge." Water and Sewage Works. Vol. 126, no. 3, March 1979. pp. 60-61.

The water conservation programs of two communities (Elmhurst, IL and Ann Arbor, MI) are briefly reviewed. Elmhurst used water-saving devices, public education, and rate changes. Ann Arbor used public education and a change in rate to reduce water usage. A copy of the monthly journal in which this article appears can be ordered for $2.00 from Water and Sewage Works, 380 Northwest Highway, Des Plaines, IL 60016.

Nelson, John Olaf. North Marin's Little Compendium of Water-Saving Ideas. Novato, CA: North Marin County Water Districts, 1976. 273 pp.

This document is an excellent source book for discussion of water conservation alternatives, water-saving devices, listing of manufacturers and distributors, and two documented case examples. Although organized similar to a catalogue, the book is quite readable. It can be obtained from the North Marin County Water District, P. O. Box 146, Novato, CA 94947 for $7.00.

A Pilot Water Conservation Program. Bulletin 191. Sacramento, CA: California Department of Water Resources, October 1978. 64 pp.

This bulletin reports on a study of the best and most cost-effective ways to introduce water-saving devices into homes. The study includes pilot programs in six California cities that were affected by the severe 1976-77 drought. This study will be of value to water suppliers and citizen groups interested in water conservation. Eight appendices are also available including a device study and reports on each of the six cities. The report is

available at no cost from California Department of Water Resources, P. O. Box 388, Sacramento, CA 95802, attn: Dean Thompson.

Rice, I. and Shaw, L. "Water Conservation - A Practical Approach." Journal of American Water Works Association. Vol. 70, no. 3, September 1978. pp. 481-2.

The article describes the approach used in Dallas, Texas, in its water conservation program. The adopted course was a peak demand surcharge to reduce water usage. The journal can be obtained for $2.00 from American Water Works Association, 6666 W. Quincy Avenue, Denver, CO 80235.

Water Conservation Devices, Residential Water Conservation. Washington, DC: U.S. Department of Interior, Office of Water Research and Technology, 1977. 10 pp.

This capsule report highlights findings of research projects funded through the Office of Water Research and Technology. It is a simple overview of the subject and is suitable for lay persons desiring information on residential water conservation. It is available from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402 as Stock No. 024-000-00837-1, at a cost of $.90 per copy.

Appendix

A. Contents of charts for use by instructor in the guided discussion. Pages may be used to make transparencies or the contents can be copied onto flip charts.

1. Major Uses of Water
2. Residential Consumption
3. Water Usage Calculation
4. Indoor Residential Water Use
5. Why Conserve Water?
6. Plan Implementation Methods
7. Pricing Structures
8. Set Price
9. Flat Rate
10. Decreasing Block Rate
11. Increasing Block Rate
12. Water Usage for Various Toilet Systems
13. Water Reuse

B. Suggested handouts for use by instructor.

1. Household Water Usage Inventory

Major Uses of Water

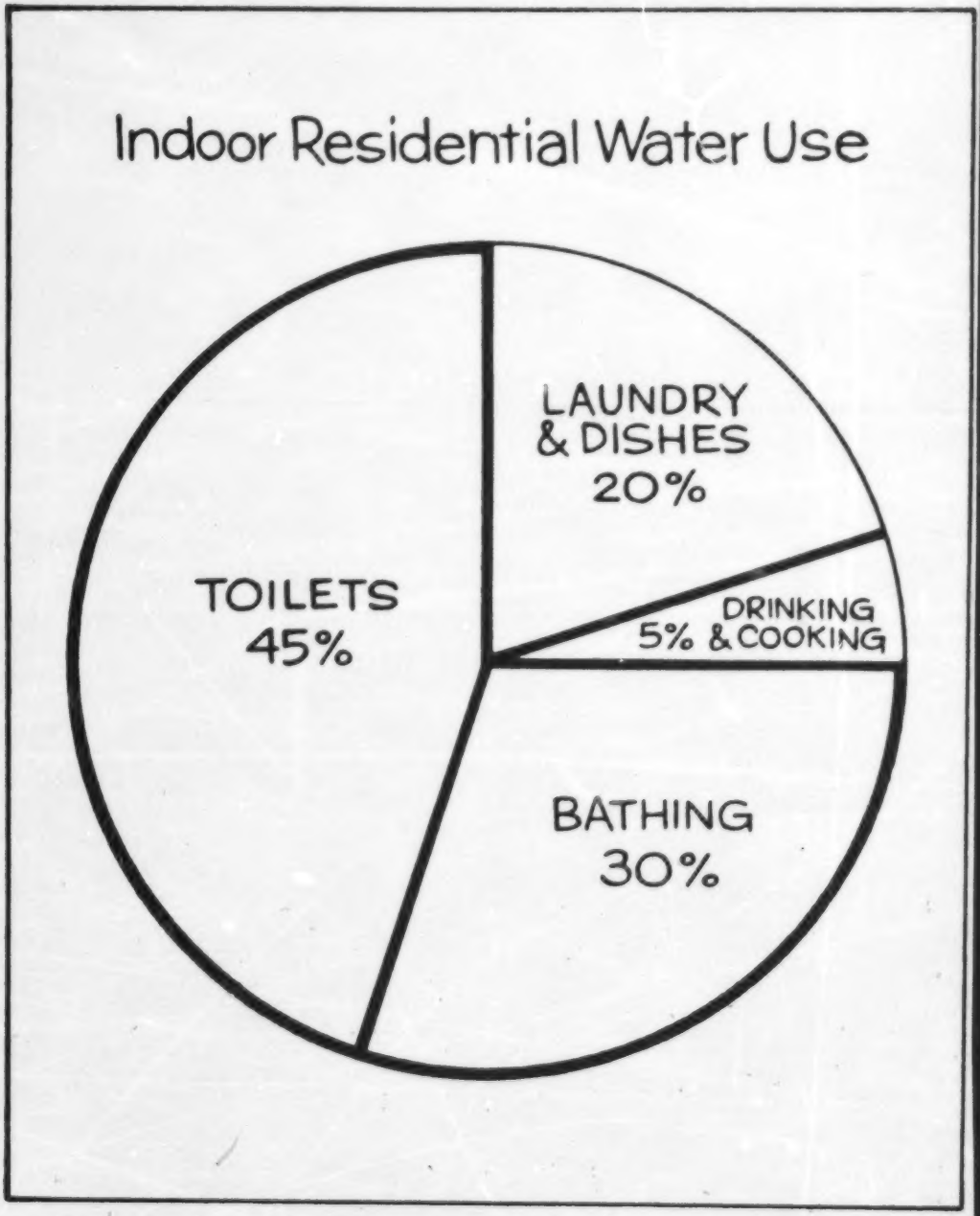
- Industrial
- Commercial
- Agricultural
- Residential

Residential Consumption

Private - 50 gallons/person/day

Public - 73 gallons/person/day

$$\frac{\text{Total gallons used in period}}{\text{Persons in household} \times \text{Days in period}} = \text{Gallons/person/day}$$


Indoor Residential Water Use
LAUNDRY & DISHES 20%
DRINKING 5% & COOKING
BATHING 30%
TOILETS 45%

Why Conserve Water?

- Water Shortage
- Wastewater Treatment Plant Overload
- Energy Savings
- Economic Savings
- Environmental Pollution
- Cost-effectiveness Guidelines

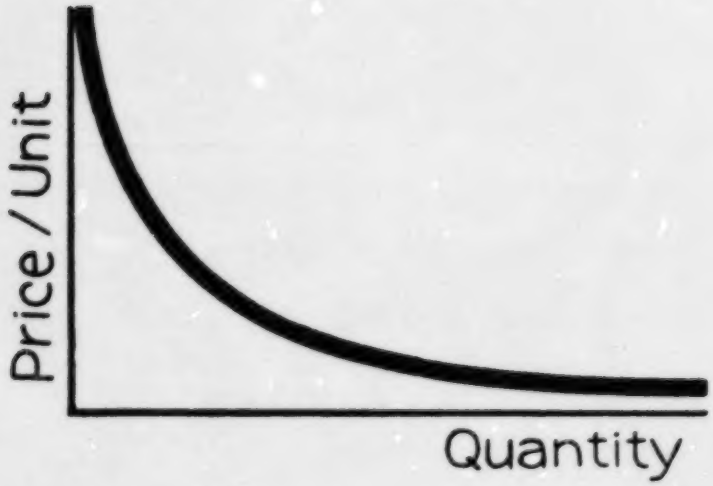
Plan Implementation Methods

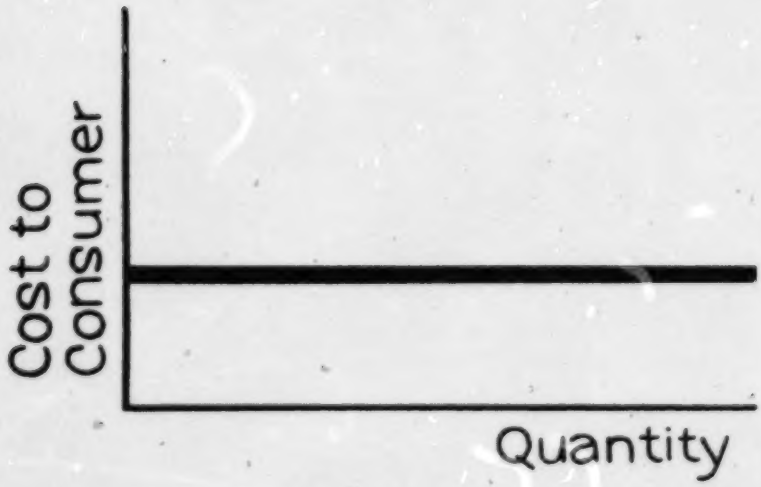
- Education
- Public Relations
- Pricing Strategies
- Plumbing Codes
- Water-saving Devices

Pricing Structures

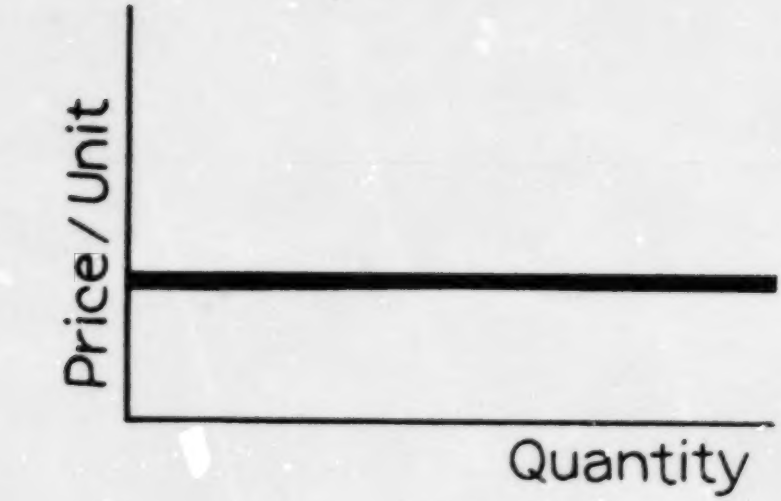
- Set Price
- Flat Rate
- Decreasing Block Rate
- Increasing Block Rate

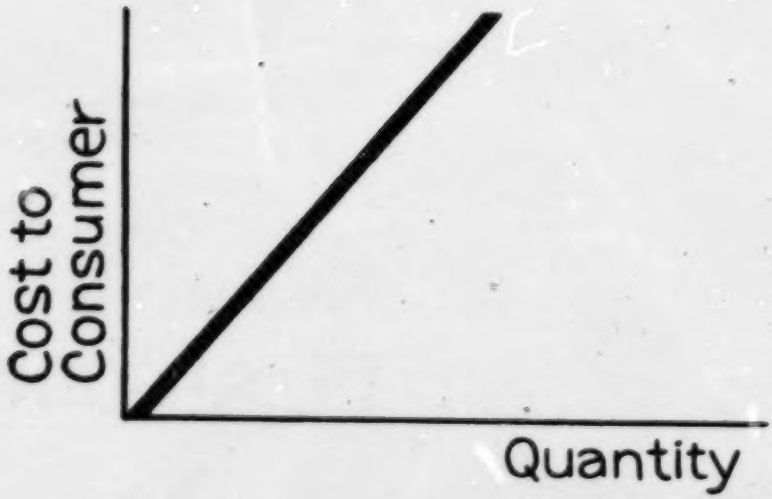
Set Price



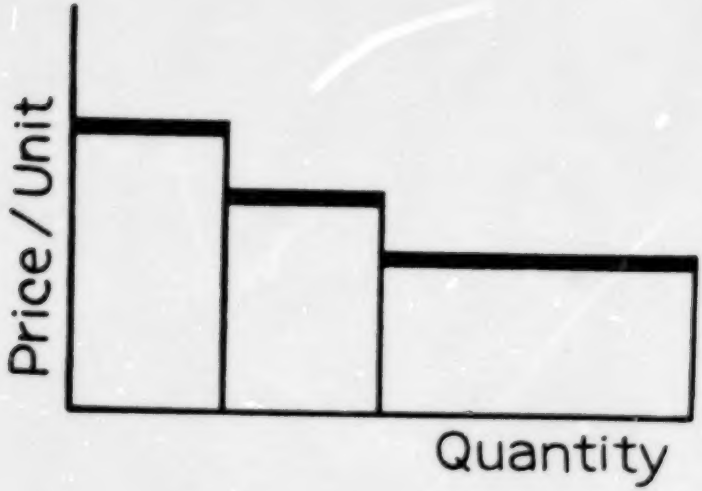


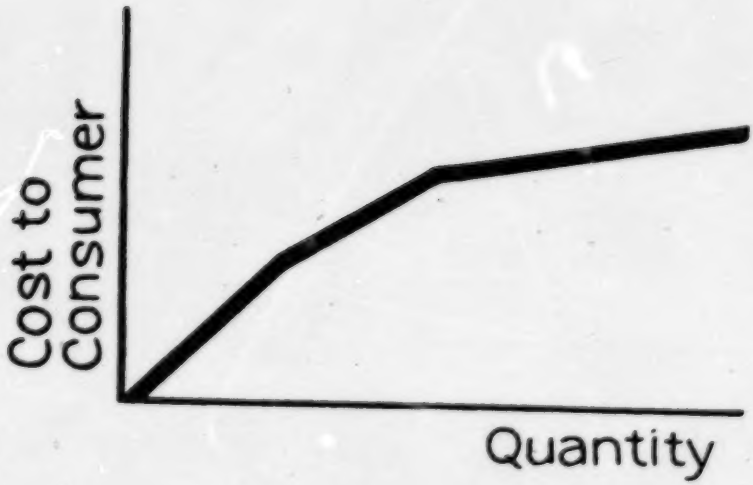
Flat Rate



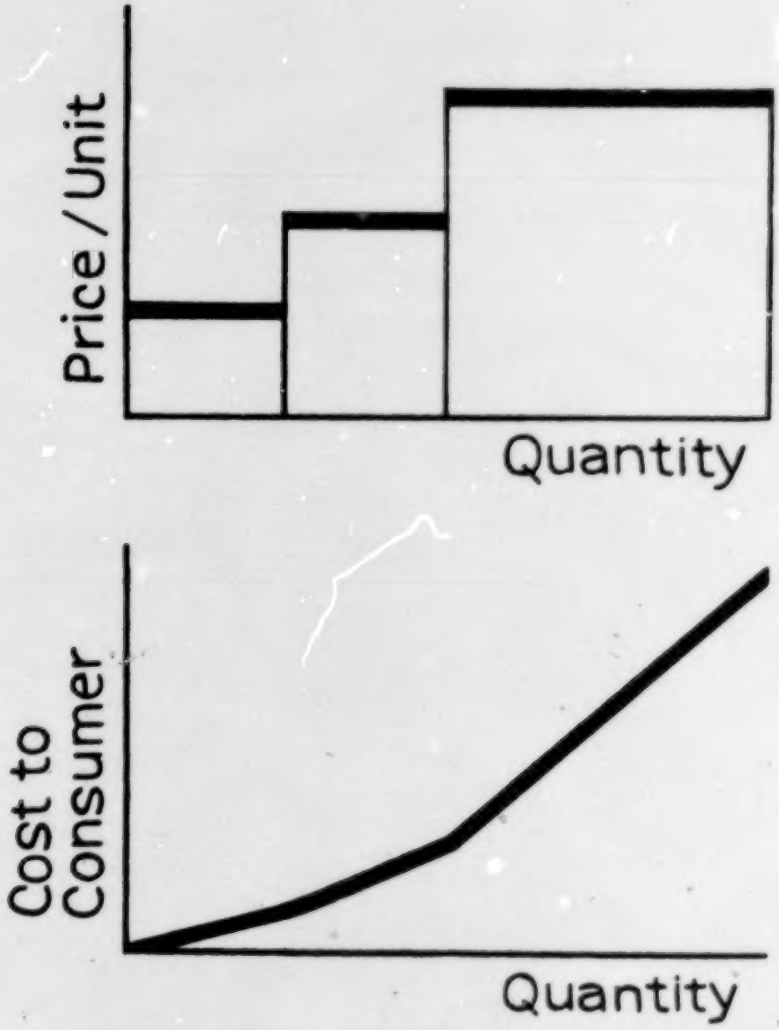


Decreasing Block Rate





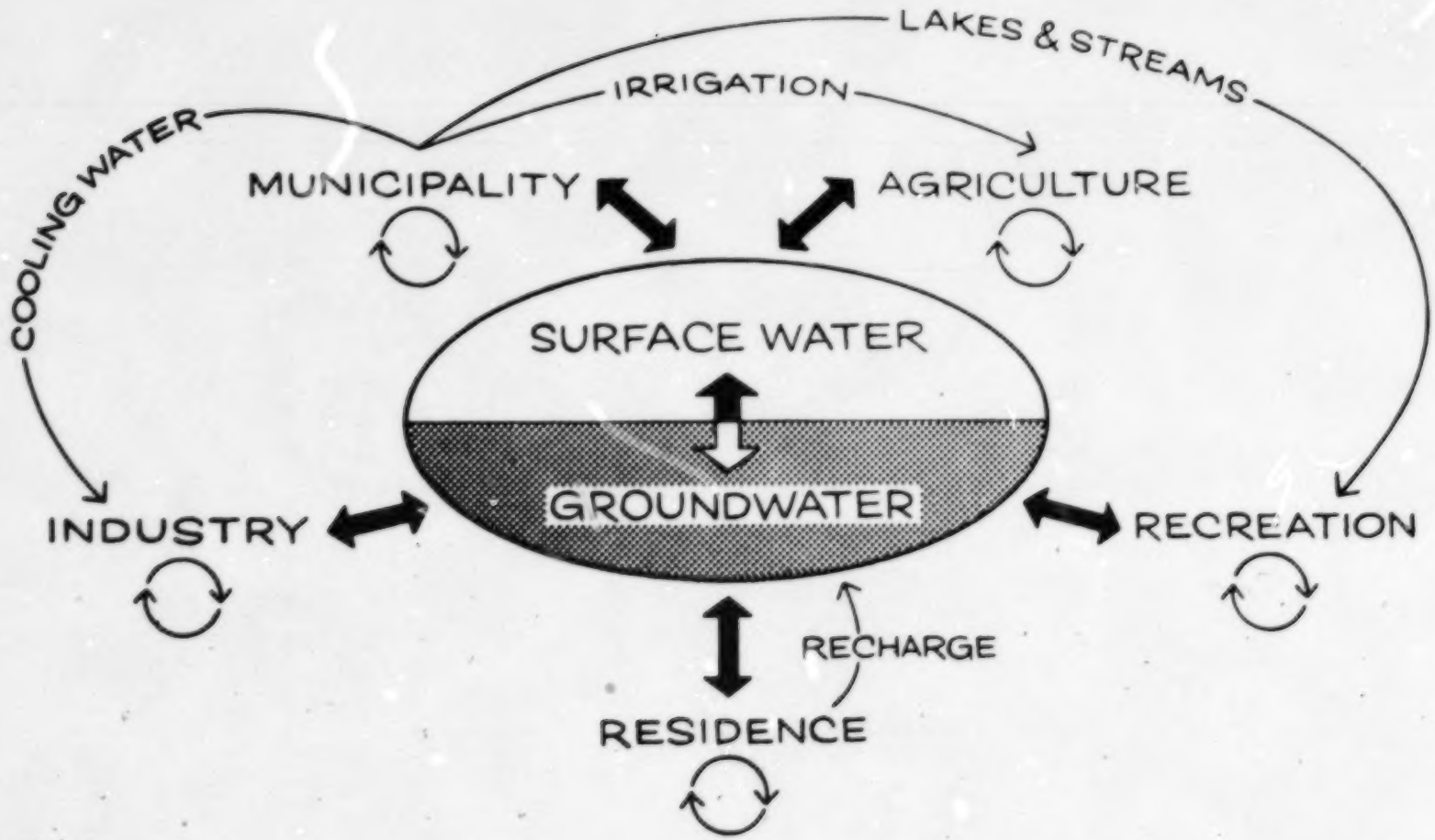
Increasing Block Rate



WATER USE FOR VARIOUS TOILET SYSTEMS

Type	Mechanism	Sewage Production (gallons/flush)
Conventional Water Closet	Water Carrier of Wastes	4.8-5.5
Conventional Water Closet	With Bottles or Dams Tank Volume Displacement	3.7-4.5
Modified Water Closet	Dual Flush Cycle and/or Reduced Tank Capacity	1.0-3.5
Vacuum or Air Toilet	Air or Vacuum Treatment	0.3-0.5
Recirculating Toilet	Filtered and/or Chemically Treated Water Recycled from Holding Tank	0.1-0.2
Incinerating Toilet	Liquids Evaporated and Solids Incinerated by High Temperature in Either Gas or Electric Furnace	0
Waterless Toilet	Composting or Oil Carrier Fluid with Incineration	0

Water Reuse



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HOUSEHOLD WATER USAGE INVENTORY

1. Calculate your per capita usage of water.

   $\frac{\text{gallons used in billing period}}{\text{persons in household x days in a billing period}}$ = gallons/person/day

   daily usage ___ monthly usage ___ yearly usage ___

   (average: private - 50 gallons/person/day; public - 73 gallons/person/day)

2. Check your water and sewer bills for pricing method and cost.

   water billing method _____
   (set price, flat rate, decreasing block rate, increasing block rate)

   cost, $/1,000 gallons _____

   sewer billing method _____
   (set price, flat rate, decreasing block rate, increasing block rate)

   cost, $/1,000 gallons _____

3. List local suppliers of water-saving devices.

   toilets _____

   showerheads _____

   retrofit devices _____ _____

4. Estimate the gallons of water you can save using water-saving devices.

   per month _____ per year _____

5. Estimate the money you can save with water-saving devices.

   per month _____ per year _____